

## CLAIMS

1. Method for controlling a direct-injection gasoline engine during regeneration of a lean NO<sub>x</sub> trap disposed in an exhaust path of the engine, the regeneration characterized by a transition from lean stratified engine operation to rich homogeneous engine operation, comprising:
  - 5                   upon initiation of a lean NO<sub>x</sub> trap regeneration event, determining a current air-fuel ratio and comparing the current air-fuel ratio to a lean limit air-fuel ratio;
  - delaying the transition from lean stratified engine operation to rich homogeneous engine operation until the current air-fuel ratio reaches the
  - 10   lean limit air-fuel ratio; and
  - initiating transition from lean stratified engine operation to rich homogeneous engine operation when the current air-fuel ratio reaches the lean limit air-fuel ratio.
2. The method of claim 1, further comprising:
  - disabling an air-fuel feedback control for a period of time following the transition into and out of the lean NO<sub>x</sub> trap regeneration event.
3. The method of claim 2, wherein the period of time for disabling the air-fuel feedback control comprises a pre-calibrated period of time.
4. The method of claim 2, wherein the period of time for disabling the air-fuel feedback control comprises an on-line estimated period of time.

5. The method of claim 1, further comprising:  
disabling an air charge feedback control for a period of time  
following the transition into and out of a lean NOx trap regeneration event.

6. The method of claim 5, wherein the period of time for  
disabling the air charge feedback control comprises a pre-calibrated period of  
time.

7. The method of claim 5, wherein the period of time for  
disabling the air charge feedback control comprises an on-line estimated period  
of time.

8. The method of claim 1, further comprising:  
adjusting a desired air charge mass following the transition into  
and out of the lean NOx trap regeneration event from an initial air charge mass  
value to a final air charge mass value over one of a pre-calibrated time interval  
5 and an on-line estimated time interval.

9. The method of claim 1, further comprising:  
setting the desired exhaust gas recirculation mass to zero.

10. The method of claim 1, further comprising:  
controlling engine torque based upon driver demand.

11. System for controlling a direct-injection gasoline engine  
during regeneration of a lean NOx trap disposed in an exhaust path of the

engine, the regeneration characterized by a transition from lean stratified engine operation to rich homogeneous engine operation, comprising:

5                    means for determining a current air-fuel ratio and comparing the current air-fuel ratio to a lean limit air-fuel ratio upon initiation of a lean NO<sub>x</sub> trap regeneration event;

                    means for delaying the transition from lean stratified engine operation to rich homogeneous engine operation until the current air-fuel ratio  
10 reaches the lean limit air-fuel ratio; and

                    means for initiating transition from lean stratified engine operation to rich homogeneous engine operation when the current air-fuel ratio reaches the lean limit air-fuel ratio.

12.     The system of claim 11, further comprising:

                    means for disabling an air-fuel feedback control for a period of time following the transition into and out of the lean NO<sub>x</sub> trap regeneration event.

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13.     The system of claim 12, wherein said period of time for disabling the air-fuel feedback control comprises a pre-calibrated period of time.

14.     The system of claim 12, wherein said period of time for disabling the air-fuel feedback control comprises an on-line estimated period of time.

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15. The system of claim 11, further comprising:  
means for disabling an air charge feedback control for a period of time following the transition into and out of the lean NO<sub>x</sub> trap regeneration event.

16. The system of claim 15, wherein said period of time for disabling the air charge feedback control comprises a pre-calibrated period of time.

17. The system of claim 15, wherein said period of time for disabling the air charge feedback control comprises an on-line estimated period of time.

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18. The system of claim 11, further comprising:  
means for adjusting a desired air charge mass following the transition into and out of the lean NO<sub>x</sub> trap regeneration event from an initial air charge mass value to a final air charge mass value over one of a pre-calibrated time interval and an on-line estimated time interval.

19. The system of claim 11, further comprising:  
means for setting a desired exhaust gas recirculation mass to zero.

20. The system of claim 11, further comprising:  
means for controlling engine torque based upon driver demand.

21. Article of manufacture comprising a storage medium having a computer program encoded therein for effecting a method for controlling a direct-injection gasoline engine during regeneration of a lean NO<sub>x</sub> trap disposed in an exhaust path of the engine, the regeneration characterized by a transition from lean stratified engine operation to rich homogeneous engine operation, the program comprising:

code for comparing a current air-fuel ratio to a lean limit air-fuel ratio upon initiation of a lean NO<sub>x</sub> trap regeneration event;

code for delaying transition from lean stratified engine operation to rich homogeneous engine operation until the current air-fuel ratio reaches the lean limit air-fuel ratio; and

code for initiating transition from lean stratified engine operation to rich homogeneous engine operation when the current air-fuel ratio reaches the lean limit air-fuel ratio.

22. The article of claim 21, further comprising:  
code for disabling an air-fuel feedback control for a period of time following the transition into and out of the lean NO<sub>x</sub> trap regeneration event.

23. The article of claim 22, wherein said period of time for disabling the air-fuel feedback control comprises a pre-calibrated period of time.

24. The article of claim 22, wherein said period of time for disabling the air-fuel feedback control comprises an on-line estimated period of time.

25. The article of claim 21, further comprising:  
code for disabling an air charge feedback control for a period of  
time following the transition into and out of the lean NO<sub>x</sub> trap regeneration  
event.

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26. The article of claim 25, wherein said period of time for  
disabling the air charge feedback control comprises a pre-calibrated period of  
time.

27. The article of claim 25, wherein said period of time for  
disabling the air charge feedback control comprises an on-line estimated period  
of time.

28. The article of claim 21, further comprising:  
code for adjusting a desired air charge mass following transition  
into and out of the lean NO<sub>x</sub> trap regeneration event from an initial air charge  
mass to a final air charge mass value over one of a pre-calibrated time interval  
and an on-line estimated time interval.

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29. The article of claim 21, further comprising:  
code for setting a desired exhaust gas recirculation mass to zero.

30. The article of claim 21, further comprising:  
code for controlling engine torque based upon driver demand.